AMENDMENT NO. 3 AUGUST 2022

TO

IS 4588 : 1986 SPECIFICATION FOR RUBBER, RAW, NATURAL

(Third Revision)

[*Pages* 4 to 6, *clauses* 1 to 8 (*see also Amendment No.* 2)] — Substitute 'raw natural rubber (technically specified rubber)' *for* 'raw natural rubber', wherever it appears in the standard.

(*Page* 4, *clause* **2.1**) — Substitute 'IS 7503' *for* 'IS : 7503 (Part 1) - 1974†'.

(*Page* 4, *clause* **3.1**, *line* 3) — Delete 'chemical'.

(*Page* 4, *clause* **4.2**) — Substitute 'Physical and Chemical Requirements' *for* 'Chemical Requirements'.

[*Page* 5, *Table* 1 (*see also Amendment No.* 2)] — Substitute the following for the existing Table:

Table 1 Physical and Chemical Requirements for Rubber, Raw, Natural

(*Clauses* 3.1 *and* 4.2)

Sl No.	**Characteristic**	**Requirements for**						**Method of Test, Refer To**
		ISNR 3 CV	ISNR 3L	ISNR 5	ISNR 10	ISNR 20	ISNR 50	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Dirt content, percent by mass, *Max*	0.03	0.03	0.05	0.10	0.20	0.50	IS 3660 (Part 1)
ii)	Volatile matter, percent by mass, *Max*	0.80	0.80	0.80	0.80	0.80	0.80	IS 3660 (Part 2)
iii)	Ash$^{1)}$, percent by mass, *Max*	0.50	0.50	0.60	0.75	1.00	1.50	ISO 247-1/ISO 247-2
iv)	Nitrogen, percent by mass, *Max*	0.6	0.6	0.6	0.6	0.6	0.6	IS 3660 (Part 10)
v)	Initial plasticity, *Min*	As agreed to between the purchaser and the supplier	30	30	30	30	30	IS 3660 (Part 11)
vi)	Plasticity retention index (PRI), *Min*	60	60	60	50	40	30	IS 3660 (Part 12)
vii)	Colour, *Max*	--	6.0	--	--	--	--	IS 3660 (Part 13)
viii)	Mooney viscosity, $ML_{(1+4)}$ at 100°C	60 ± 5	--	--	--	--	--	IS 3660 (Part 7)
ix)	Accelerated storage hardening (ΔP), *Max*	8	--	--	--	--	--	Annex A

[1)] In case of dispute, ISO 247-1 shall be the referee method.

[*Page* 4, *clause* **5.1**, *line* 1 and *line* 5 (*see also Amendment No. 2*)] — Substitute 'raw natural rubber (technically specified rubber)' *for* 'block rubber'.

(*Page* 6, *clause* **6.2**) — Substitute the following for the existing clause:

'**6.2 BIS Certification Marking**

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.'

(*Page* 6, *clause* **7.1**, *line* 3) — Substitute 'IS 5599' *for* 'IS : 5599-1970*'.

(*Page* 6, *clause* **8.1**) — Insert the following new clause after **8.1**:

'**9 REFERENCES**

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreement based on standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
3660 (Part 1) : 1999	Methods of test for natural rubber: Part 1 Determination of dirt [NR:1] (*third revision*)
3660 (Part 2) : 1985	Methods of test for natural rubber: Part 2 Determination of volatile matter [NR:2] (*second revision*)
3660 (Part 7) : 2013/ISO 289-1 : 2005	Methods of test for natural rubber: Part 7 Determination of mooney viscosity [NR:8] (*third revision*)
3660 (Part 8) : 1999	Methods of test for natural rubber: Part 8 Mixing and vulcanizing of rubber in standard compound [NR:9] (*second revision*)
3660 (Part 10) : 2000	Methods of test for natural rubber: Part 10 Determination of nitrogen content [NR:11] (*first revision*)
3660 (Part 11) : 2017	Methods of test for natural rubber: Part 11 Determination of plasticity — Rapid-plastimeter method [NR:12] (*second revision*)
3660 (Part 12) : 2017/ISO 2930 : 2009	Methods of test for natural rubber: Part 12 Determination of plasticity retention index (PRI) [NR:13] (*second revision*)
3660 (Part 13) : 1997	Methods of test for natural rubber Part 13 Determination of colour (NR:14) (*first revision*)
7503 : 2018/ISO 1382 : 2012	Glossary of terms used in rubber industry
5598 : 1986	Code of practice for bale coating packing and marking of natural rubber (*first revision*)
5599 : 1999	Rubber — Raw , natural and synthetic — Methods for sampling and sample preparation (*first revision*)
ISO 247-1 : 2018	Rubber — Determination of ash: Part 1 Combustion method
ISO 247-2 : 2018	Rubber — Determination of ash: Part 2 Thermogravimetric analysis (TGA)'

(*Page* 6, *clause* **9**) — Insert the following new Annex after **9**:

'**Annex A**

(*Clauses* 3.1 *and* 4.2)

ACCELERATED STORAGE-HARDENING TEST

A-1 OUTLINE OF THE METHOD

A-1.1 The accelerated storage-hardening test (ASHT) involves the measurement of the rapid plasticity of standard test pellets before and after a short period of storage under conditions which accelerate the storage-hardening reaction. Accelerated storage-hardening is achieved by storing standard test pellets over phosphorus pentoxide at atmospheric pressure at 60°C for 24 h. The resultant increase in plasticity (ΔP) represents the accelerated storage-hardening.

A-1.2 Accelerated storage-hardening test provides an indication of the tendency of solid natural rubber to increase its viscosity during storage as a result of the formation of cross-links between the rubber molecules. These cross-link formations are contributed largely from some condensation reactions involving aldehyde groups naturally present in the rubber molecule and presumably, to a much smaller extent, from peroxidic groups in the rubber. The ASHT, therefore, is a means of characterizing viscosity stabilized rubbers.

A-2 APPARATUS

A-2.1 Parallel Plate Plastimeter — This shall be equipped with a l0 mm platen. Other details of the plastimeter shall be as given in **4.1** of IS 3660 (Part 11).

A-2.2 Punch — The punch is used for the preparation of test pellets of approximately constant volume quickly and without difficulty. It shall comprise a flat-ended cylindrical anvil and a coaxial tubular knife moving independently of one another; a single action of the handle shall compress a portion of the material to approximately 3 mm in thickness and shall cut out a disc approximately 13 mm in diameter.

A-2.3 Steam Generator — The steam pressure on the gauge attached to the instrument should be able to read from 5 to 20 kPa (approximately 0.05 to 0.20 kgf/cm^2). The new generation machines have no steam generator as it is operated hydrolytically to the required pressure.

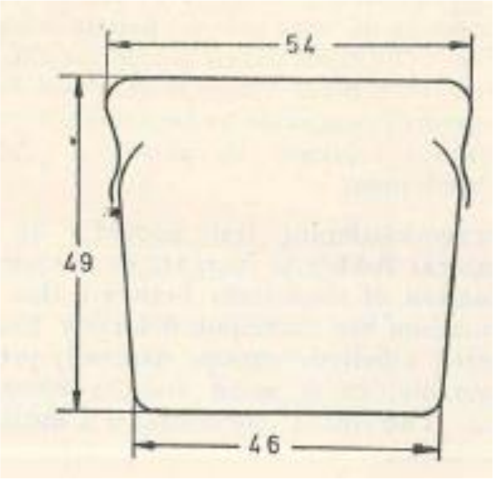
A-2.4 Mixing Mill — The mixing mill shall comply with the requirements as given in IS 3660 (Part 8).

A-2.5 Laboratory Oven — The oven shall be such that temperature fluctuation is ± 1°C over a 24 h period; temperature variation is ± 1°C throughout the working space, and recovery of oven is ± 1°C of the set temperature in a time not exceeding 10 min after inserting a full load of weighing bottles.

A-2.6 Thickness Gauge — The gauge shall have a scale graduated in unit divisions of 0.01 mm fitted with a flat contact of about 9 mm diameter.

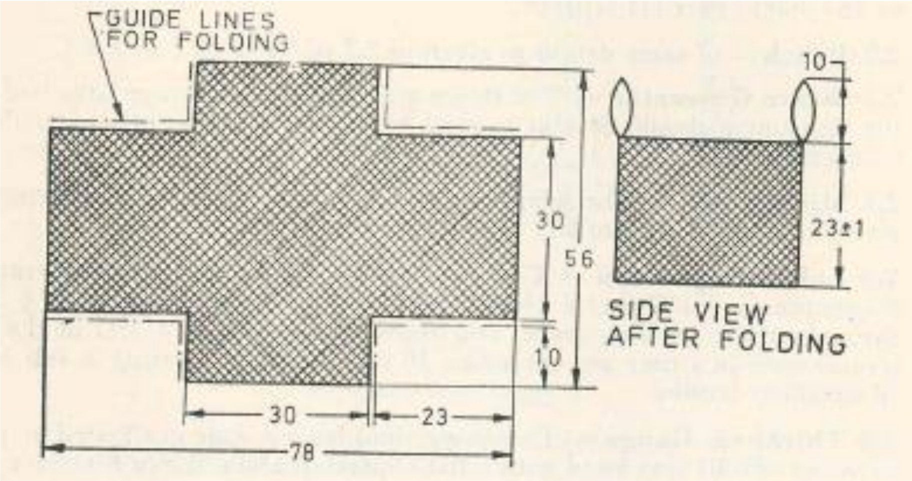
A-2.7 Weighing Bottles — These should preferably conform to dimensions shown in Fig. l with quick fit joints.

A-2.8 Test Pellet Platform — This shall be fabricated from stainless steel mesh as shown in Fig. 2. It is used with the weighing bottle as shown in Fig. 3.



All dimensions in millimetres

FIG. 1 WEIGHING BOTTLE



All Dimensions in millimetres

FIG. 2 TEST-PELLET PLATFORM

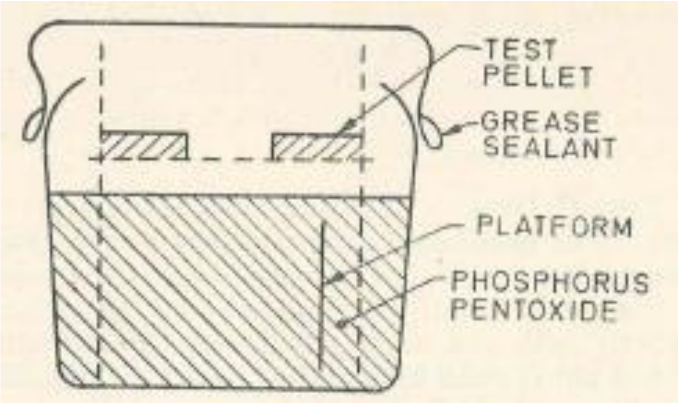


FIG. 3 WEIGHING BOTTLE WITH TEST PELLETS

A-3 PROCEDURE

A-3.1 Preparation of Test Pellets — Pass a test portion about 30 g three times through the rolls of the mixing mill (doubling the sheet between passes), with nip setting adjusted such that the final sheet thickness is about 1.7 mm. If the sheet so obtained after two passes does not meet the thickness requirement, reject it and take a fresh test portion of the homogenized sample and repeat the operation by readjusting the nip setting. The sheet which shall be free from holes is immediately doubled and the two halves pressed lightly together by hand. Cut 6 test pellets from the doubled sheet with the punch as illustrated in Fig. 4.

A-3.1.1 The test pellets shall be discs of rubber of thickness between 3.2 to 3.6 mm and approximately 13 mm in diameter and 0.40 ± 0.04 cm^3 in volume. The test pellets are divided into three sets. Pellets marked 1 are for determining initial plasticity and pellets marked 2 are for determination of plasticity after storage.

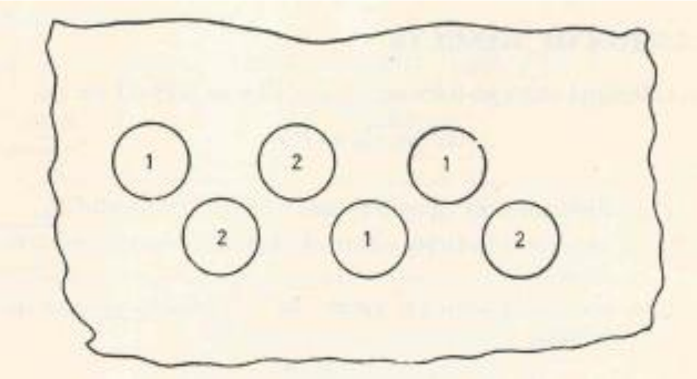


FIG. 4 APPROXIMATE POSITION FOR PUNCHING PELLETS

A-3.2 Storage of Test Pellets — The weighing bottle and test pellets shall be clean and dry. The weighing bottle with test pellets ready for storage shall be as shown in Fig. 3. It is important that the conditions specified like height of test pellet platform, quantity of phosphorus pentoxide (6-8 g) are strictly adhered to if good test reproducibility is to be obtained. The test pellet shall be equally spaced on the platform with no two test pieces in contact with one another.

> NOTE — After each test, the test pellet platform should be changed, the phosphorus pentoxide removed and replaced with 6-8 g of fresh stock. The bottle is then ready for the next test. After being used twice or thrice, the weighing bottle is washed and dried. Waste phosphorus pentoxide should be kept in a glass beaker and covered with a petridish. When all the dry phosphorus pentoxide has been converted to liquid meta-phosphoric acid (overnight storage will suffice) it may be disposed of relatively easily. Water shall not be poured on to dry phosphorus pentoxide.

A-3.3 Temperature and Duration of Storage — Test pellets shall be storage-hardened at 60 ± 1°C for 24 ± 0.l h. After 30 min in the oven, the bottles shall be checked for airtightness of the lids and the timing of the test started.

A-3.4 Measurement of Plasticity — Non-storage-hardened test pellets shall be kept apart and the plasticities of these tested concurrently with the storage-hardened test pellets. Carry out the plasticity measurements by the method given in IS 3660 (Part 11).

A-4 EXPRESSION OF RESULTS

A-4.1 The accelerated storage-hardening shall be expressed as:

$$\Delta P = P_H - P_o$$

Where

ΔP = difference in plasticity units between P_H and P_o;
P_H = median plasticity value of 3 storage-hardened test pellets; and
P_o = median plasticity value of 3 non-storage-hardened test pellets.’

(PCD 13)

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